

Objective: Layout a process for determining an OBT load using QuickLoad.

Setup the cartridge, The minimum criteria to select (circled in red) are the a bullet, cartridge case, length and barrel length.

QuickLOAD Cartridge Dimensions

Selected Bullet: file:\308 Selected Cartridge: .308 Win.

Tail/Base Shaped Friction-proofed

	Inches	mm	psi	bar
Seating Depth	0.464	11.79	Pmax (MAP)	60190 / 4150.0
Shank Seat Depth	0.464	11.79	Meas. Method	Piezo CIP
Bullet Length	1.250	31.75	Grains	Bullet Weight
Bullet Diameter	0.308	7.82	155.0	10.044
Cartridge Length	2.800	71.12	Sq. inches	Cross-sectional Bore Area
Case Length	2.014	51.16	.073641	47.51
Groove Caliber	0.308	7.82	Grains H2O	Maximum Case Capacity, overflow
Barrel Length	20.0	508.0	58.00	3.766
Bullet Travel	18.45	468.63	Volume Occupied by Seated Bullet	8.746 / 0.568
			Useable Case Capacity	49.256 / 3.198
			Weighting Factor	0.5

Apply&Calc

Look up an OBT for your rifle barrel's length. In this example I have selected 1.03 for my 20" barrel. I just happen to know from experience any faster OBT produces chamber pressures greater than I prefer.

Node / mS	1	2	3	4	5	6
16" bbl	0.55	0.61	0.69	0.75	0.82	0.88
17" bbl	0.58	0.65	0.73	0.79	0.87	0.94
18" bbl	0.61	0.68	0.77	0.83	0.92	0.99
19" bbl	0.64	0.72	0.81	0.88	0.98	1.04
20" bbl	0.67	0.75	0.86	0.92	1.03	1.10
21" bbl	0.71	0.79	0.90	0.97	1.08	1.15
22" bbl	0.74	0.82	0.94	1.01	1.13	1.20

Select a powder. I usually start with IMR 4895. Then enter either a % fill or a charge weight in the QuickLoad Charge window to drive the barrel time to the match the selected OBT shown in the QuickLoad Results window. Note, 1.026 ms rounds up to the 1.03 ms OBT. I do not think getting down to .001 ms makes a significant difference.

QuickLOAD Charge

Selected Propellant: IMR 4895

Heat of Explosion / Potential: 3890 kJ/kg

Ratio of Specific Heats: 1.2431

Burning Rate Factor Ba: 0.6100 1/s

Pro- or Degressivity Factor a0: -0.1500

Progressive Burning Limit z1: 0.643 x 100%

Factor b: 1.5909

Propellant Solid Density: 1.580 g/cm³

Shot Start (Initiation) Pressure: 3625 psi

Filling/L.R. or Charge Weight

98.7 % 43.0 Grains 2.786 Grams

Apply&Calc

QuickLOAD Results

Maximum Chamber Pressure (Pmax): 3594 bar / 52132 psi

Bullet Travel at Pmax: 29.7 mm / 1.17 in.

Load Density: 0.908 g/cm³ Energy Density: 3532 J/cm³

Values when Bullet Base Exits Muzzle...click here for more data

Muzzle Pressure: 619 bar / 8984 psi

Muzzle Velocity: 812 m/s / 2665 fps

Barrel Time, 10% Pmax to Muzzle: 1.026 ms

Projectile Energy: 3314 Joule / 2444 ft.-lbs.

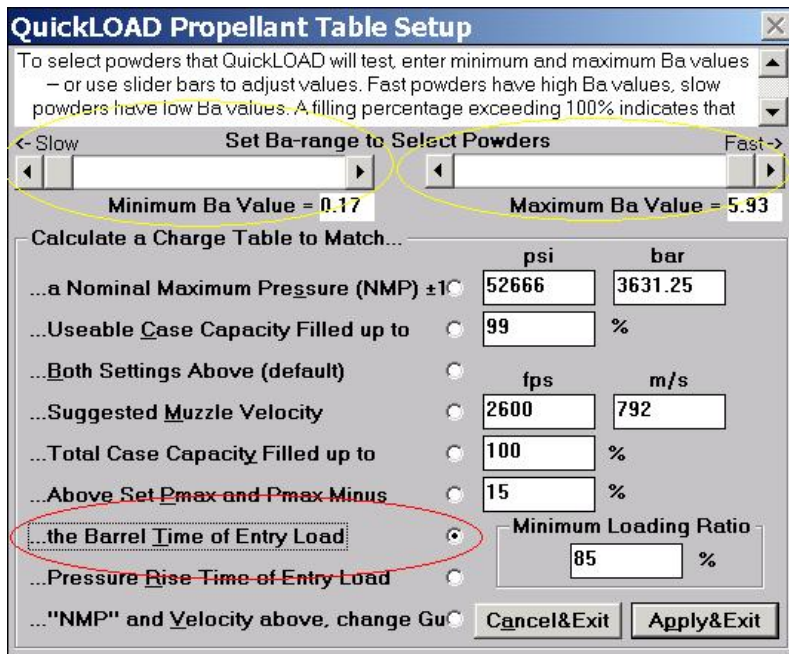
Amount of Propellant Burnt: 97.91 % Ballistic Efficiency: 30.6 %

Results without any guarantee on usability ! WARNING: Near Maximum Average Pressure - tolerances may cause dangerous pressures ! End of combustion after the projectile exits muzzle.

Once a load is calculated that will generate the desired OBT the idea is to determine what other powder charges will generate the same OBT so you can interrogate those results to determine which one best fits the OBT load criteria. I

would like to mention at this point that my experience has been IMR 4895 always seems to come out as a top contender when working with the .308 Win. Consequently I use it as a starting powder when ever I am looking into a new .308 Win load. This may be true for other cartridges that are suited to a medium burn rate type of powders too, I simply do not have the experience to comment about it.

To get the list of powders open the Propellant Setup Table and select the radio button for "...the Barrel Time of Entry Load" then click on the "Apply and Exit" button. Notice too that I had selected 85% for the Minimum Loading Ratio and the Ba range was set from the minimum to the maximum setting. This will produce the largest selection of powders considering all burn rates that will occupy at least 85% of the case volume.



The list, without printing the whole thing will look like this;

Cartridge : .308 Win.
 Bullet : .308, 155, LAP Scenar GB491
 Cartridge O.A.L. L6 : 2.800 inch or 71.12 mm
 Barrel Length : 20.0 inch or 508.0 mm

Predicted Data for Indicated Charges of the Following Powders.
 Matching Barrel Time: 1.026 milliseconds

These calculations refer to your specified settings in QuickLOAD 'Cartridge Dimensions' window.
 C A U T I O N : any load listed can result in a powder charge that falls below minimum suggested loads or exceeds maximum suggested loads as presented in current handloading manuals. Understand that all of the listed powders can be unsuitable for the given combination of cartridge, bullet and gun. Actual load ordering can vary, depending upon lot-to-lot powder and component variations.
 USE ONLY FOR COMPARISON !

60 loads produced a Loading Ratio below user-defined minimum of 85%. These powders have been skipped.

Powder type	Filling/Loading Ratio %	Charge Grains	Vel. fps	Prop.Burnt %	P max psi	P muzz psi	Btime ms	
Accurate XMR 4064	108.7	45.8	2741	99.9	57553	10398	1.026	! HOT LOAD !
Accurate XMR 2495	103.9	43.3	2739	100.0	58239	9903	1.026	! HOT LOAD !
Somchem S365	115.7	50.1	2725	97.9	51688	11443	1.026	! HOT LOAD !
Accurate XMR 4350	113.2	49.3	2718	94.8	53308	11278	1.026	! HOT LOAD !
Norma 203 old	109.3	46.6	2712	97.9	55124	10758	1.026	! HOT LOAD !
Norma 203B	102.9	44.8	2710	98.1	53999	10737	1.026	! HOT LOAD !
Rottweil R903	109.4	46.6	2709	97.7	55107	10744	1.026	! HOT LOAD !

...

This listing was set to sort on MV (Vel. fps). At this point I export the list to MS Excel where it is easier to sort and cull out the powders that exceed 103 % Loading Ratio, chamber pressures that exceed 56k psi, and powders that are not available which are generally those with names that I cannot pronounce. ☺

This is the final list, sorted by “Prop. Burnt %”, looks like this in Excel;

No.	Type	mc (gr)	fill (%)	vel (fps)	Pmax (psi)	Z (%)	t (ms)
1	Vihtavuori N133	40.5	97	2602	55,466	100	1.0260
2	IMR 3031	41.8	100	2,704	53,610	100	1.0258
3	Hodgdon H322	40.1	89	2,654	54,088	100	1.0262
4	Ramshot X-Terminator	41.0	88	2,660	55,194	100	1.0258
5	Accurate No.2520	45.2	97	2,704	55,549	99	1.0259
6	Hodgdon H335	43.5	89	2,669	54,298	99	1.0260
7	Winchester 748	44.2	94	2,689	53,351	99	1.0259
8	Ramshot TAC	43.6	96	2,667	54,541	98	1.0260
9	Hodgdon BL-C2	45.3	93	2,689	54,939	98	1.0260
10	IMR 4895	43.0	99	2,665	52,123	98	1.0259
11	Alliant Reloder-15	44.7	103	2,692	54,523	96	1.0260
12	Ramshot BigGame	47.1	102	2,691	52,778	96	1.0262
13	Winchester 760	49.1	104	2,681	52,767	91	1.0260

As can be seen there are several powders to select from leaving the hand loader some latitude to apply subjective considerations for which powder to select. You know, things like company/powder reputation, brand loyalty or previous customer service experiences, etc. For this project, I also have the requirement to achieve a MV of 2650 fps in order to make the 155 fly on a trajectory line that is close to the 175 SMK when launched at 2675 fps.

It’s a personal battle I’ve been engaged with to make the 20” 700P LTR perform on par with its bigger brother the 24 “ bbl 700P, but I digress. Initially I focused directly on achieving the 2650 fps and I arrived at several selections (<http://home.comcast.net/~ltrdavid/155Scenar.pdf>) but going through this process I believe I struck upon a better selection.

Finally, I check the mfr recommended max loads and consider that information in my selection too.